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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/884,720	06/19/2001	Richard R. Hengst	6096-01	2520

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City Place II  
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Hartford, CT 06103-3402

EXAMINER

KACKAR, RAM N

ART UNIT	PAPER NUMBER
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1763

12

DATE MAILED: 07/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/884,720

Applicant(s)

HENGST, RICHARD R.

Examiner

Ram N Kackar

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 June 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6,9,11-16,29,30 and 32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6,9,11-16,29,30 and 32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_                      6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 4-6, 11-15, 29-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Richard R Hengst (US 5931666) in view of Lu et al (US 5904778).

Hengst et al disclose a vertical wafer boat with plurality of support rods for supporting plurality of silicon wafers having ceramic body of SiC or recrystallized SiC (Col 2 line 60), having ceramic coating of SiC to prevent migration of impurities (Col 5 line 32-45) and surface roughness to prevent slip of less than 1  $\mu\text{m}$  (Col 4 lines 14-22), horizontal base, top plate, support rods, plurality of slots, each having ceramic coating and surface finish (Fig 1).

Hengst et al disclose ceramic coating of silicon carbide but do not disclose its thickness.

Lu et al disclose SiC coating on sintered Silicon carbide being 100 $\mu\text{m}$  or less (Col 6 line 21-23).

Therefore it would have been obvious for one having ordinary skill in the art at the time invention was made to have a thickness of less than 100 microns because too thick a layer may have a tendency to peel and too thin layer may not provide adequate protection.

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3. Claims 1-6, 9, 11-15, 29-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inaba et al (JP 11016993) which later became (US Patent 6093644) in view of Lu et al (US 5904778).

Inaba et al disclose a vertical wafer boat for supporting silicon wafers having ceramic body (Fig 1 and Col 1 line 34) having ceramic coating to prevent migration of impurities (Col 1 line 20) and surface finish over the coating to prevent slip in substrates of large diameters (Col 1 line 20) and at high temperature (Col 1 line 13), maximum roughness of the finish less than 10  $\mu\text{m}$  and an impurity of less than 0.1 ppm (Col 3 line 14 and 15), horizontal base (Fig 1-13), top plate (Fig 1-12), support rods (Fig 1-11) and plurality of slots (Fig -14), each having ceramic coating and surface finish (Col 2 line 47).

Inaba et al disclose ceramic coating of silicon carbide but do not disclose its thickness.

Lu et al disclose SiC coating on sintered Silicon carbide being 100 $\mu\text{m}$  or less (Col 6 line 21-23).

Therefore it would have been obvious for one having ordinary skill in the art at the time invention was made to have a thickness of less than 100 microns because too thick a layer may have a tendency to peel and too thin layer may not provide adequate protection.

4. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inaba et al (JP 11016993) which later became (US Patent 6093644) or Richard R Hengst (US 5931666) in view of Larry S Wingo (US 6171400).

Inaba et al or Richard R Hengst both, disclose a vertical wafer boat for supporting silicon wafers having ceramic body but do not disclose a stress relief slot and location notch.

Wingo discloses wafer boat having both stress relief slot and notches at the base (Fig 1).

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Therefore it would have been obvious for one having ordinary skill in the art at the time invention was made to use the teaching of Wingo so as to be able to avoid problems due to thermal expansion and be able to place the boat correctly on processing platform.

***Response to Amendment***

5. Applicants arguments filed 06/17/2003 have been considered but not found to be persuasive.

Applicant argues that the two limitations pertaining to amended claims 1 and 30 make them allowable over prior art. These limitations being the surface roughness of the wafer contact surface being less than or substantially equal to 0.4 micron and the preventive thickness of ceramic coating being 30-60 or 30-40 micron.

Examiner disagrees. Hengst (5931666) discusses both slip caused by gravitational as well as frictional forces. Discussing frictional slip, at Col 4 lines 14-22 he discloses the reason why low roughness (low friction) or higher smoothness is desired to reduce slip, explaining that the slip is caused by stress produced when roughness (friction) prevents smooth expansion of the wafer during heating. Similar reasoning has been proposed by Inaba et al (6093644) at Col 1 lines 61- to Col 2 line 28. From these teachings it is clear that at the time of invention the mechanism of friction induced slip was well understood and it was known that the roughness should be as small as possible, less than 10 micron, less than 1 micron or even less to avoid the friction induced slip. Both clearly disclose the desirability of roughness as low as possible.

Applicant states that Inaba et al teach away from the invention. This assertion is incorrect. It would have been teaching away if Inaba et al would have said that higher roughness would be

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desirable for preventing slip. Inaba et al have positively maintained the desirability of having roughness less than  $R_{max}$  of 10 micron (Abstract and Col 2 lines 52-55). Disclosure of particle adhesion as a function of  $R_{max}$  in Inaba et al in table II is not directed to the issue of frictional slip, even though here also, there is a strong evidence of desirability of low  $R_{max}$ . In view of the above, applicants acceptability of 0.4 micron is in the nature of routine optimization within bounds of 0-1 micron as established by the prior art. This type of optimization has been held obvious.

Regarding the issue of the protective ceramic coating of 30-40 micron applicant argues that the coating thickness of 100 micron or less was known outside of semiconductor fabrication equipment.

Examiner does not agree. The patent issued to Lu et al where this protective coating thickness of less than 100 micron is disclosed is concerned with semiconductor manufacturing. This proves that at least on the filing date or on the publication date of Lu et al patent, one of ordinary skill in the semiconductor art had this knowledge in his/her possession.

With the teaching of Lu et al, it would have been obvious for one of ordinary skill in the art to further optimize the thickness so as to be able to get adequate protection and not have have film peel off due to being too thick.

Regarding applicants remark about location of reference in Inaba et al in the last office action Col 1 line 34 onwards was related to ceramic coating.

### ***Conclusion***

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N Kackar whose telephone number is 703 305 3996. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 703 308 1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9310 for regular communications and 703 872 9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0661.

RK  
July 23, 2003

*primary Examiner  
AU 1763  
P. Hassenzadel*